

Free & Open Source Software for Microfinance:

Increasing Efficiency and Extending Benefits to the Poor

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Abstract

In this paper we investigate the potential of open source software to increase the impact of microfinance (MF) especially for the very poor and suggest a framework for econometric evaluation of such intervention. We argue that especially small and medium organizations play a crucial role, because they are more flexible in operations and familiar with the local context. We consider how new information and communication technology (ICT) can increase outreach of MF to the very poor within a self-sustainable holistic approach. We consider the potential of free/open source software projects to address the computing needs of small and remote MFIs, and we describe the reasons why no suitable solutions have emerged yet. While the use of FOSS and ICTs in general can help increase outreach, we feel the need to draw attention to the challenges that come with it; one should not forget that access to basic financial services is not all that is needed - especially by the very poor.

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"The Millennium Development Goals can be met by 2015 but only if all involved break with business as usual and dramatically accelerate and scale up action now."

UN Secretary General Kofi Annan

1 Introduction - Difficulties of providing financial services to the poor

The basic notion of microfinance is to provide very poor families with very small loans in order to help them engage in productive activities or grow their tiny businesses.

The spark for microfinance is the story of the Grameen (Village) Bank of Bangladesh: In the 1970s Muhammad Yunus, an economics professor at a Bangladesh university, initiated this institution that was the first one to make small loans to poor local villagers who lacked access to traditional formal financial institutions.³ Around the world, scores of state-run banks had already tried to provide loans to poor households, and they left a legacy of inefficiency, corruption, and million of dollars of squandered subsidies. After these failure of past attempts of poverty alleviation through the provision of subsidized credits in the early 1950s through the 1980s it was unclear where the idea of microfinance would go - it turned out to be one of those ideas that have enormous implications: It generated enormous enthusiasm among aid donors and nongovernmental organizations (NGOs) as an instrument for reducing poverty in a manner that is financially self-sustaining and it is believed to have the potential to turn the Millennium Development Goal of cutting absolute poverty in half by 2015 into reality.

In this paper we consider two important issues, which are widely discussed in the literature on microfinance, in the context of information and communications technology (ICT). The first issue concerns the outreach of institutions, mainly the outreach to the rural poor, including the very poor those that are usually left out and do not profit from the microfinance industry. The second issue concerns the delivering institutions and their financial self-sustainability. Usually, increasing outreach and becoming financial self-sustainable is seen as a trade-off. Targeting the very poor comes at high costs, so that institutions that aim for the former usually depend on donor funds and subsidies. Morduch (2000) refers to this debate as the "microfinance schism", which centers on whether in order to achieve self-sufficiency, microfinance institutions (MFIs) must target marginally-poor or non-poor clientele so as to capture economies of scale and cover costs.

By definition most of the very poor live in rural areas with poorly devel-

³Only recently, did he and Grameen Bank receive the Peace Nobel Price 2006 for their work and achievements.

oped infrastructure. It can take a full day to reach the closest bank and the opportunity costs by and large outweigh the benefit of such a lost day. Furthermore, many institutions have come to realize that their poor clients, just like anyone else, are in need of more than purely credit. A diverse range of financial instruments is needed to build assets, stabilize consumption and protect against risks. *Microcredit* developed into *microfinance*, including not only credit but also other financial services such as savings and insurance and one observes a further broadening of the concept to include services such as training, food programs, etc. Credit delivery in combination with such other services is often referred to as an *integrated* or *holistic* approach and has become increasingly popular over the last years. One of the main contributors to this development is Vijay Mahajan, director of BASIS India, based in Hyderabad, who fostered, together with Tomas Dichter, the idea of livelihood promotion. The success of this integrated model has spurred similar projects in other countries such as Kenya and Papua New Guinea.

In section 2 of this paper, we argue that especially small organizations play a crucial role within the holistic approach. Section 3 describes the information and communication technology needs and challenges of microfinance institutions, and considers the case of BASIS India, before focusing on the special technology needs of the important small institutions. Most examples and case studies in these sections are drawn from India given the country's extensive experience and success in the microfinance industry. In section 4 we introduce free/open source software as a solution to provide a common technology platform to increase efficiency of smaller MFIs. In section 5 we complement our discussion on how to increase outreach, by describing a simple methodology for evaluating the impact of MF. Finally, this leads us to a few recommendations, which are expanded in the conclusions.

2 Microfinance Overview - Why Small Organizations are needed

While we are safe to say that microfinance is a successful and important tool in alleviating poverty it is difficult, if not impossible, to track how many institutions are involved. The issue starts by defining what a “microfinance institution” actually refers to. The term is mostly used for all types of formal and semi-formal institutions that offer microfinance services but does not specify how many of their operations should be devoted to microfinance services and how their client profile should look like. This leaves a wide range of institutions including, but not limiting to, banks⁴, regulated MFIs⁵, (micro) credit companies⁶, credit (and savings) cooperatives and credit unions⁷ and Development NGOs and other non-profit microfinance intermediary facilitators.

The formal sector in India for example includes apex institutions such as the National Bank for Agriculture and Rural Development (NABARD), Small Industries Development Bank of India (SIDBI), and Rashtriya Mahila Kosh (RMK). At the retail level, Commercial Banks, Regional Rural Banks, and, Cooperative banks provide micro finance services. In 2004, the estimated number of such retail credit outlets of the formal banking sector comprised 60,000 in the rural areas. Of these 60,000 about 12,000 were branches of district level cooperative banks, over 14,000 were branches of the Regional Rural Banks (RRBs) and over 30,000 rural and semi-urban branches of commercial banks. In addition almost 90,000 cooperatives credit societies at the village level were in operation. These numbers imply that on an average, there is at least one retail credit outlet for about 5,000 rural people. (Rao, 2004)

Then there is the informal sector for which it is much more difficult to get a hold of accurate numbers. No published data on the number of informal moneylenders exist and even for private MFIs operating in the country, only estimates can get hold of. Rao (2004) reports that the estimate for private MFIs in India is about 800, split up in legal forms as displayed in Table 1.

Be they formal or informal, a survey of 700 households in twelve states of India undertaken 2001(see Datta & Sriram (2003)) shows the importance that of any of these credit sources play. As can be seen from Table 2,

⁴companies that fall under national banking laws with considerable microfinance activities (Banco del Desarrollo in Chile, Banco Solidario in Ecuador, but also the rural banks - BPRs - in Indonesia)

⁵financial intermediaries that are subject to government or Central Bank rules and regulations but are not banks (EDPYMEs in Peru, Fondos Financieros Privados in Bolivia).

⁶non-regulated companies involved in microfinance (Share Microfin Ltd. in India, Cambodian Entrepreneur Building Ltd.).

⁷formally registered cooperatives and unions that provide microfinance services to their members (SACCOs in Kenya, MACAPFs in Bulgaria).

Types of MFIs	Estimated Nr.
1. Not for Profit MFIs	
a.) NGO - MFIs	400 - 500
b.) Non-profit Companies	10
2. Mutual Benefit MFIs	200 - 250
3. For Profit MFIs	6
Total	700 - 800

Source: Rao (2004)

Table 1: Legal forms of private MFIs in India

only 11% of the surveyed households do not make use of any credit source. All remaining 89 percent borrowed either from a formal, informal or both sources.

% of HHs	Credit Source
37	ONLY formal
17	formal & informal
35	ONLY informal
11	neither

Source: Datta & Sriram (2003)

Table 2: Borrowers' access to credit in India

In India, the great majority of microfinance institutions are small, meaning they serve not more than 2,500 clients. Of the 700-800 institutions included in Rao's study, only ten (hence only between one and two percent) MFIs report to have an outreach of 100,000 or more microfinance clients. This distribution is reflected all over the world. A campaign launched by the Microcredit Summit in 1997 undertakes every year a survey of microfinance institutions and find that in 2005 about 73% of surveyed institutions serve fewer than 2,500 clients, as displayed in Table 2.⁸

Naturally, although small institutions make up about 73% of all institutions, this does not imply that they also serve 73% of the market. For most countries, such as Brazil and to an extreme extend also India, the

⁸Network numbers given in the table "include data from three large networks: the National Bank for Agriculture and Rural Development (NABARD), see footnote 14, in India; the Association of Asian Confederation of Credit Unions (ACCU), which has 3,137,398 total and poorest clients, and the Bangladesh Rural Development Board (BRDB) which has 3,713,728 total clients and 3,528,041 poorest. These entities are not individual microfinance institutions, but they report the aggregate number of clients served to the Microcredit Summit and are included accordingly in our report, after we have eliminated any double counting." (Microcredit Summit Campaign Report, 2005, p.25)

Size of Institution (in terms of poorest clients)	Nr. of Institutions	% of Institutions
1 million or more	8	0.3
100,000 - 999,999	41	1.3
10,000 - 99,999	276	8.7
2,500 - 9,999	515	16.3
Fewer than 2,500	2,321	73.4
Networks	3	0.1

Source: Microcredit Summit Campaign Report 2005, p.25, Table 3

Table 3: Number of Institutions by Size

reverse is actually true: Small institutions serve usually not more than 25% of all microfinance clients. Nevertheless, despite their relatively low number of poorest clients there are a number of reasons why we consider the small institutions as especially crucial for alleviation of poverty.

First, “small institutions appear more likely to enter the microfinance market” (ADB, 2000). Considering that about 84 percent of the potential microfinance clients in the world are estimated to have no access to credit yet⁹, the need for more microfinance institutions in the market becomes obvious. In order to get more players into the market we must then ask how those small organizations, that show the necessary entrepreneurship, can be supported and entry barriers reduced.

In addition, it is the small and local organizations that have the potential of servicing those clients that are often left out by microfinance - the very poor. Institutions too often either do not prioritize or do not successfully reach this group. Reasons include the high costs of servicing the poorest people (since the very poor are not the most attractive clients for standard financial services), which collides with the increasing pressure of becoming financially self-sustainable. The very poor struggle with the most basic problems of food security and health and their primary concern is survival. It is not obvious how providing simple loans to this group can end the circle of poverty they are trapped in. A much more integrated approach, one that has the overall goal of establishing a regular source of income is needed; this can include financial services but more often starts with much more resource intensive activities, such as training and food assistance. The importance of offering such quality and flexible services is widely recognized as the means to response to the wide variety of the poors needs and many microfinance institutions started to diversify their portfolio of products and services offered. Since studies (see for example Morduch, 1998) show that the very-poor are

⁹The estimate of how many poor people are not being reached differ by sources and country considered. Muhammed Yunus states at the International Seminar on Attacking Poverty with Microcredit in Dhaka, Bangladesh, January, 2003, that “In most countries it [microfinance] has not even reached 10% of the poor families within that country.”

still left out, the question arises whether institutions operating on a large scale are flexible enough to give the very poor the specialized attention they need, since this does not only demand time but also precise knowledge of the environment - something which small and localized institutions can offer.

“In developing countries like India - mainstream approaches and institutions fail to reach the poorest, especially in remote and less developed regions like northeastern and eastern India. Many voluntary non government organizations (NGOs) play a significant role in fostering meaningful opportunities for the poor, particularly in innovating ways for them to work together towards self reliance and to deal effectively usually with the mainstream. NGOs depend heavily on foreign funds in the absence of indigenous sources of non government funding and highly bureaucratic and schematized nature of government funding. Consequently, smaller NGOs often closest to poor people, cannot raise funds as they lack access to international donors. Much potential for outreach and innovation thus remains unharnessed.”

From the purpose of Rashtruya Gramin Vikas Nidhi (RGVN)¹⁰

3 Information and Communication Technology and Microfinance

The Consultative Group to Assist the Poor (CGAP) estimates that currently about 500 million poor people have access to microfinance services. While this is a considerable number, it is, as mentioned before, only about 16% of those that could benefit - only one sixth of the three billion poor people of working age have access to formal financial services. These numbers naturally imply the need to reach further and deeper - the need for a whole range of institutions that focus on very poor people and innovate to reach more of them in sustainable ways.

“With current grant-based practices, nonstandard data and the lack of infrastructure, microfinance institutions seeking growth will have difficulty even doubling their operations. New business practices and innovative solutions that do not require constant infusions of donor funds need to be applied if the industry is to achieve a breakthrough in scale,” (Sanchez, 2003)

The use of new information and communication technology (ICT) offers opportunities to lower the cost of financial services provision. This is especially beneficial for small MFIs - those that battle to become self-sustainable and

¹⁰<http://www.rgvnindia.org/genesis.htm>

are important for increasing the outreach of (holistic) microfinance interventions to the very poor. Ketley & Duminy (2003, p.2) go as far as stating that "...the message is clear technology is changing the entire banking landscape. The poor are more and more becoming a viable target market for conventional banks. MFIs need to understand this challenge or risk becoming irrelevant."

The ICT needs of microfinance institutions mainly focus on four objectives: (1) exchanging information with remote clients; (2) processing and managing data at the institutional level, both at central offices and in remote locations; (3) reducing the potential for loss during monetary transactions (collection/delivery) in remote areas; and (4) reporting requirements for accreditation and to attract donor funding. A Management Information System (MIS) that addresses the needs of MFIs consists of different components, including hardware components (desktop and server computers, hand-held devices, mobile phones, etc.), network components and protocols (GSM or other mobile cellular networks, Internet, local area networks, etc.) and software components (user interfaces, databases, etc.). The focus of this paper is the software layer, which most directly represents the codified business processes of an institution. In order for a software solution, to be appropriate to the needs of diverse organisations and settings, and to ensure its adequacy in the future, it must be customizable. Only then will software be able to adapt to new institutional structures, higher volumes of activity, new pricing methods, new reporting standards, or any other relevant changes (Waterfield & Ramsing, 1998).

The previous analysis of types and numbers of microfinance institutions provides a taste of the complexity that comes with the topic. This complexity is further enriched through the wide range of services offered by the institutions. Looking at financial services alone, there are numerous different lending methodologies within microfinance, ranging from village banking over solidarity groups to individual lending. Also the methods for interest and payment calculations vary from one institutional model to the next and so do the number of loan products offered. At the front-office level, especially organizations that work in rural areas need to take into account literacy levels and consider the use of indigenous languages. At the back-office level, where transactions are processed and assets tracked, an MIS needs to allow integration with different processing protocols that are in use by national banks and provide interfaces to upstream financial service providers. This intricacy is exacerbated given that many of these variations occur inside the same institution. Furthermore social, political, economic, regulatory, legal, and cultural aspects shape the environments that organizations operate in, and differ substantially between states, countries, and regions. All these issues are of relevance when talking about the right type of software for an

institution. Not to forget, that these are spread all over the world so that different currencies, languages, and reporting requirements come into play (Mainhart, 1999).

This diversity causes technology needs to differ between organizations. Waterfield & Ramsing (1998) suggest a simple breakdown to consider different software needs mainly by the organization's size and its stage of development: (1) small-scale efforts with less than 2,000 clients, (2) institutions undergoing transition into large-scale institutions, serving between 2,000 and 10,000 clients, and (3) large-scale microfinance institutions, with more than 10,000 clients. Small MFIs, those that fall within the first category, may manage their operations with manual ledgers or spreadsheets. Not last because manual data input is time consuming and error-prone, most MFIs eventually need an MIS to track financial transactions and create reports for management, donors, and regulators (CGAP Donor Brief No. 23, 2005) in order to grow or achieve self-sustainability. Expanding institutions go through "growing pains": The need to deal with substantial increase in activity and resources, as well as the need to become more systematic in their operating procedures in order to handle a much larger volume of information. Their technology requirements now include security provisions, the recording and reporting of auditing information, and ability to reliably handle much larger volumes of transactions. At the same time, these organizations often lack the managerial and technical skills to implement and use such sophisticated systems (Waterfield & Ramsing, 1998).

A fast changing environment and pressure to innovate present further challenges for software solutions and require the possibility for new features to be bolted on. New technologies that may make a dramatic difference to how microfinance institutions deliver services to their clients emerge rapidly. Latest developments include the adoption of handheld devices, the increasing diffusion of automatic teller machines (ATMs) and mobile banking - the use of mobile phones to execute transactions.

We will use the simple size-based categorisation for the remainder of this paper, but need to stress that different types of software solutions are needed even for organizations that are of similar size and development. Some of the other concerns include the local regulatory environment, the history and philosophy of the organization, the types of services it offers. As a result a large number of MFIs who use ICT rely on custom-built solutions. According to a CGAP study mentioned on the Microfinance Open Source Project website, 46% of respondents used custom solutions and only 10% off-the-shelf products (the remaining 44% used no ICT).¹¹

¹¹<http://wiki.java.net/bin/view/Javatools/MifosFaqs>

3.1 The case of BASIX

In this section we present the case of an Indian MFI, BASIX India¹², to illustrate some of the just described ICT needs and challenges faced by microfinance institutions.

BASIX India is an institution established in 1990s, promoting the generation of livelihoods, working with almost 200,000 poor households in 44 districts and nine states across India. It can hence clearly be classified as a “big” institution, falling into the third “software-need” category. This implies a departure from our focus on small institutions, which we considered appropriate since the experience of BASIX India nicely illustrates that software can be developed, which meets the demand of different microfinance institutions (including small ones) and that even with custom-made software, continuous adaptation is of great importance - be it for different approaches taken, to include or change to new technologies or simply to handle growth of the organization; all issues that obviously weigh heavily on an institutions budget.

Based on the particular needs, BASIX India had its own information system developed from scratch: FAMIS (Financial Accounting and Management Information System) was developed in 1995¹³. The following eight years that their operations ran on this software, several alterations had to be made in order to increase functionality and robustness. Besides being adapted for their own use, BASIX supplied their software to several external MFIs, which in each case required tailoring to issues such as different lending technologies and interest calculation methods. One of these external users is for example Rashtriya Gramin Vikas Nidhi (RGVN), lending to groups as well as to small NGOs, and serving about 32,000 active borrowers.¹⁴ Business analysts spent a lot of time with the organization and its staff in order to understand processes crucial for the adaptation of the software and translate them into software functionality. This was the case for every organization they worked with, increasing the number of different versions and hence the complexity greatly. To deal with this problem, FAMIS PLUS, a unified version was developed that supports credit, savings and insurance. FAMIS was well suited for the needs of a small MFI, but did not scale well to accommodate the significant growth BASIX experienced. In response to future needs, a new solution named Delphix was developed. After almost five years of running pilots, fixing problems that occurred when migrating data and further adapting the software, BASIX completed migration to Delphix in 2005. Advantages of this system include extremely rich

¹²This case study draws heavily on Regy & Mahajan (2006).

¹³The development partner for the software is the company Sadguru Management Consultants, who have subsequently been involved with other BASIX software development projects.

¹⁴<http://www.mixmarket.org>

reporting features, and its flexibility regarding terminology, interest calculation method and lending/saving methodology. This set of more powerful features has led to the software being used by more than 50 organizations today, which shows the feasibility of establishing a common core solution - across organizations, and countries.

Nevertheless, continuous adaptation is needed, especially given the fast-changing environment that microfinance institutions face. Not only does this imply high costs but oftentimes issues such as time-constraints pose further obstacles that determine what technology changes exist. This can be exemplified, drawing again on the experience of BASIX India. For example, in 2005, BASIX launched urban operations in Hyderabad which called for the handling of new functionalities. Instead of going through the process of implementing modifications in Delphix, they chose to implement an existing (but separate) solution. Another example is IDIAS, which stands for Insurance Distribution and Administration System. This software was entirely developed in-house and BASIX is only working today on implementing these features into Delphix, although the software is already used for almost four years. The urge to offer the health, rainfall and livestock insurance that the software handles, outweighed the advantages of delaying its operationalization.

3.2 The ICT challenges of small MFIs

Most software for MFIs is highly customized and developed by and for large organizations, often with significant financial support from donors, and not with the needs of smaller rural organizations in mind. In addition, most solutions are proprietary (or built on top of proprietary technology), which means their owners charge licensing fees for use of the software and control who can make changes to it. This is particularly unfortunate since even in cases where the owners do not charge for use of the software (Regy & Mahajan, 2006). This lack of competition can lead to high costs for training and customization. Cost is one factor that prevents access to the technology especially for smaller and remote organizations that cannot afford the required capital investment or pay to modify existing packages to suit their needs.

However, the list of obstacles, specific to these small organizations goes on:

- Lack of skilled staff to support the MIS
- Lack of local IT support and services environment for after-sale service, training, and support
- Lack of budget to procure and update/upgrade technology

- Technology needs are too diverse to warrant the usefulness of an off-the-shelf package and existing solutions require costly modifications or are too sophisticated.
- High need for localization (language of interface, iconography, etc.)

In the section to follow, we will elaborate why we see Free and Open Source Software as a solution that has the potential of tackling the problems and challenges just illustrated.

4 Free and Open Source Software

During the past decade a new model for development of software has become very popular and holds considerable promise for the computing needs of small and remote MFIs. Free/Open Source Software (FOSS), is “software which is liberally licensed to grant the right of users to study, change, and improve its design through the availability of its source code” (Wikipedia, 2006). More specifically FOSS is developed by an international community of volunteer contributors, in a commons-based peer production model (Benkler, 2002) and makes explicit the rights that are typically reserved by copyright. These include (1) the right to modify the software; (2) to use the software with almost no restrictions; (3) to freely share the software with others; and, in order to enable modifications, (4) the right to inspect the source code. FOSS alternatives for many of the popular proprietary software products exist, and are used by private and public sector organizations in developing and developed countries. In some areas, such as webserver software, FOSS applications are market leaders.

Based on the experience of free/open source software projects in other areas we can identify a few advantages that the FOSS model holds in the microfinance context.¹⁵

FOSS enables the pooling of resources. Most small MFIs lack the financial means to purchase proprietary software licenses and donors might be reluctant to purchase software licenses for each MFI that they work with. However, in FOSS projects, networks of users contribute their expertise to design the system, and share the cost of development and maintenance. This lowers the financial burden on the individual users. Some literature suggests that larger numbers of users also lead to better detection and fixing of bugs and errors, however conclusive evidence is missing.¹⁶

¹⁵Some good starting points are the community access project in the Extremadura region of Spain, or the development of the Open Office suite of applications.

¹⁶The positive influence of having more people inspect the source code is typically referred to as “Linus Law”, http://en.wikipedia.org/wiki/Linus's_law, last accessed August 2006.

FOSS comes without the requirement to pay a license fee.¹⁷ This is the case not only when the software is first installed, but also considering any future upgrades. In addition, FOSS can be installed on as many computers as desired, enabling an organization to share it with others, or a donor to distribute it to all of its partners. It is important to note that FOSS is not free of cost, since use of software requires hardware and services, but it removes software licenses from total cost of ownership. Despite statements to the contrary, license costs do matter when adjusted to the local earning potential (Ghosh, 2003).

The combination of no license costs with the ability to share and distribute creates an interesting mechanisms for donor intervention and funding. The potential multiplier effect of paying for software development once, and then sharing it with all of one's partner organizations is attractive to donors, who are reluctant to pay software license costs in each of the projects they support.

While resource pooling enables the creation of a common basic core solution, the cornerstone of FOSS remains the ability to customize the software. Every user remains free to develop extensions or custom modules for her specific needs (or hire someone to do it). This enables the development of very customized solutions, and is cost-effective since a common basic starting point exists and can be used free of charge and competition for customization services is high. Ideally these contributions are then shared back with the community, increasing the value of the software to all participants.

Availability of a FOSS solution can stimulate development of a local support and service sector. Rural MFIs will require training, technical support and adaptation of the software. Small local entrepreneurs and companies (who, in the FOSS model, are granted full access to the source code) can best address these needs, because they understand the local context. These local entrepreneurs can benefit from the free transfer of knowledge that is embedded in a software application and capture a much larger share of the value-added than resellers of proprietary software can (Ghosh, 2005).

Considering these potential advantages one cannot fail to wonder why a FOSS solution for micro-finance institutions has not yet emerged. And indeed first attempts have been made (see for example the efforts by SEMBA Consulting, and the Grameen Technology Center, which will be described in more detail below), but so far none have succeeded in creating a full-fledged MIS or build a community of users and developers that could support the effort in sustainable fashion. We must ask what the reasons are that hold back development efforts of a FOSS solution, and how they could be overcome. Some of the most important factors, especially in the context of

¹⁷While FOSS licenses do not prevent sales of the software, most licenses mandate the availability of source code and the right to redistribute, which reduces the potential market to one customer.

MF, are mentioned below:

- *Lack of awareness* - Despite its success in many areas of computing perception of FOSS is still clouded by misconceptions. Especially outside of technical circles, it is not often considered a credible alternative for proprietary software; it is suspected to be hard to install and use as well as instable. These impressions are way outdated.
- *Lack of donor support for software development activities* - Many donors fund capacity development, or infrastructure projects, but rarely the salaries of software engineers who develop FOSS.
- *Lack of computer engineering skills in many developing countries* - While India boasts a thriving IT sector that is exporting services and products, most other developing countries are struggling to find the IT skills their economies need.
- *Difficulties to adapt management strategies* - FOSS projects require very different approaches to management, structure and hierarchy than closed source software development, where paid programmers develop applications that are designed by their managers. FOSS development processes are community-based, with clear hierarchies, and sets of roles (Lee & Cole 2003, Raymond, 2000), but it is not well understood how individuals take on certain roles. It is not an easy task to create a vibrant FOSS community and there are numerous examples of failed projects on the sourceforge.org website, which offers free hosting of FOSS development projects.
- *Reluctance to commit initial investment* - While FOSS projects are community-based, they are usually started and managed, by a small group of individuals or organisations, who invest resources in developing a first version of the software. As Eric Raymond explains in his seminal piece (2000) on FOSS development in the real world of software solutions for MFIs, a basic prototype must be developed in a small group as a starting point for community involvement. According to Raymond it is sufficient if the software will “(a) run, and (b) convince potential co-developers that it can be evolved into something really neat in the foreseeable future. (Raymond, 2000, pg. 10). In the MFI context a higher level of usability might be required to convince potential partners of the value of joining the effort.

4.1 The case of Grameen Foundation Technology Center

The Grameen Foundation has been one of the most active supporters of a FOSS micro-finance application. In their first attempt, the Microfinance Open Architecture Project (MOAP) was started with a strong community approach and invited active participation in design and development. The project highlighted the difficulties of steering a software development process that is inherently community-based and driven by self-motivated software developers. Well into the development one of the lead contributors left the project and publicly announced his dissatisfaction with the direction it was taking. These problems led Grameen to reconsider their original strategy and they decided to more directly intervene during the initial development phase. They subsequently engaged Aditi, an Indian software development firm, to build the first release of the software now named Microfinance Open Source Platform (MIFOS).¹⁸ The goal became to create a first version with satisfactory levels of functionality and stability and test it with a number of MFIs before releasing it as an open source project. The first release is intended for late 2006. Meanwhile the source code for MIFOS is already open and available, but Grameen reserves the right to determine what changes are made to it. Grameen complements the technology development, with efforts to build a community of MFIs that will use the software and support each other, and a network of volunteer programmers, who contribute development time to the project. The project is attempting to create the foundation for the type of FOSS ecosystem we describe in the next section.

4.2 A FOSS Ecosystem for Microfinance

Successful FOSS projects are community-based collaborative efforts in which participants benefit from the aggregate contributions more than they would from individual proprietary investments. In the case of microfinance, a FOSS ecosystem would enable the development of a core software platform that could be customized to fit the needs of large as well as small MFIs. Such an ecosystem will comprise the following elements:

Microfinance institutions - Large MFIs have the resources to invest in development of a core software solution. They would benefit from pooling of resources and sharing of expertise and are able to attract donor funding for such technology development projects. Since access to the core solution is free of charge, and modifications are equally shared with the community, small MFIs would get access to a software solution that addresses their needs at low cost. In addition, they would equally benefit from sharing expertise with other small MFIs.

¹⁸<https://mifos.dev.java.net/>

Another benefit for large MFIs would be the opportunity to provide upstream services to smaller MFIs since using the same core software makes it easier to integrate more closely. *Service providers* - Some large MFIs might have in-house software development staff, but in general all MFIs outsource such services. Both small and large MFIs would turn to service providers for customization of the software, support and training, but large MFIs would play a more active funding role in the design and development of the core software. Since FOSS creates opportunities for smaller service providers to be financially sustainable (a larger share of the value added is retained locally) even small MFIs would provide sufficient demand for the establishment of specialised service providers in rural areas. This would solve the current lack of support and lack of skilled in-house staff that is one obstacle to use of technology in small MFIs.

Donors - A FOSS ecosystem in microfinance provides numerous opportunities for donor intervention, but does not depend on donor funding. However, especially in the initial phase donors could provide incentives to risk-averse large MFIs who are sceptical of the success of a FOSS project. Later, donors can choose to support the customizations needed by small MFIs to start using the software (which would be increasingly less cost-intensive as more other MFIs are developing similar modifications).

Policy-makers - Support from the public sector – in the form of awareness raising, education, training, and direct investment - has been important for FOSS projects in sectors where the use of technology promises to enhance socio-economic development, but market-based competition fails to provide optimal levels of investment. The success of MF in battling poverty, indicates that it is such an area in which public sector intervention could be justified.

5 Framework for Impact Analysis

What the eye does not see, the heart does not grieve about.
(Old English Proverb)

Besides the progress and increase in outreach that can more easily be attained by the use of FOSS and ICTs in general, we feel the need to draw attention to the challenges that come with it; one should not forget that the pure access to financial services is not necessarily all that is needed especially by the very poor. Issues such as training, additional services and market linkages are of great importance. The success of the implementation of FOSS solutions cannot purely be measured by numbers of people reached. All too often do impact assessments of new technologies or implementation of software concentrate on the beginning of the chain, meaning in particular on changes in the MFI and its operations, and not sufficiently on the benefits it brings to the customers. Focus lies typically on MFIs flexibility in operations and reporting, sustainability... These assessments belong to the school of thought commonly referred to as the “intermediary” school (Hulme, 2000) and associated with the Ohio State University School’s analyses of rural finance.

While all these are important aspects that will without any doubt be affected, we see the importance in assessing who benefits and how, and hence follow the intended beneficiary school of thought, getting as far down the impact chain as possible (Hulme, 2000). One needs to know how the poor deal with the options given to them and whether MF helped them to improve their standard of living.

In what follows we lay out how the effect of a program on customers reached can be estimated at relatively low cost. Given that a discontinuity takes place in time-dimension, which is clearly defined, the proposed technique is the before-after design, also called interrupted time-series design. These techniques can be improved upon with an additional data collection effort, involving control groups, but hence also higher costs.

The main scenario in assessing the effect of any intervention is simple one usually compares two people, one receiving the intervention and the other not. If the two people are exactly the same, other than their intervention status, then the difference between their outcomes of interest (such as income) can be taken as the effect of the intervention. If the individuals differ, differences in outcome cannot be purely attributed to the intervention. And of course, it is impossible to have exactly the same people and hence assessing the impact requires making an inference about the outcomes that would have been observed for program participants had they not participated often referred to as the potential-outcome approach to causality. In the empirical literature on program evaluation, one of the most commonly-used approaches to construct this counterfactual, is to compare a person

with him- or herself. Behind it lies the idea that persons can be in both states at different times, and that outcomes measured in one state at one time are good proxies for outcomes in the same state at other times at least for the no-treatment state (Heckman & LaLonde, 1999). The control responses (outcomes) come from the era before the intervention, the treated responses come from the era after.

From this emerges the ‘before-after (BA) estimator, which can nicely be applied in the setting at hand. In order for this method to be applicable, longitudinal data on outcomes measured before and after a program for a person who participates needs to be available. After explaining the methodology we will go into more detail on which variables are needed and oftentimes already exists and hence no additional effort has to be put into data collection.

5.1 Methodology

The BA design identifies the post-break effect $E(y_1 - y_0 | d = 1)$, where y is the outcome of interest, the subscripts 0 and 1 indicate before and after the intervention respectively and d is the treatment indicator, so that $d = 1$ specifies that an intervention takes place and $d = 0$ that it does not. In our setting, if we want to estimate the effect of a loan¹⁹ d , taken in time period t on income y , we can compare y before and after the receipt of the loan.

In this approach, one makes one crucial assumption, namely that $y_0 \perp (d | x)$, where x are characteristics of the individuals, also referred to as covariates. This assumption states that post program outcome is independent of treatment status (given the covariates). Put it differently, one assumes that changes in the overall state of the economy between $t = 0$ and $t = 1$, or changes in the life cycle position of a cohort of participants, do not influence the evolution of the outcome with the intervention differently than without it. If this assumption is violated however, the model is misspecified and one might get the false impression that d matters.

While this evaluation strategy is not particularly novel, we want to draw attention to the fact that almost no extra data collection effort necessary in order for microfinance institutions being apply to apply this methodology and hence to get an idea of whether their programs have a positive impact on their customers lives.

Microfinance institutions usually ask new clients to fill out an application form when applying for a loan. The information captured in the form can be used as before data. As one wants to account for many characteristics of the individuals the more information is provided from the application form the better. Clients of BAISX India for example have to fill out a registration

¹⁹We define here as an intervention taking up a loan. Different services offered by microfinance institutions could be thought of.

form and additionally an appraisal form is completed when applying for a loan. These two documents together already give a wide range of information on the client, from the occupation, revenues, assets, place of residence²⁰, information on other family members (occupation, sex, age, educational status), expenditures, etc.

‘After data is usually not readily available and would therefore have to be collected additionally. The same questionnaires should be used and could be filled out after successful repayment of a loan or at point of default. Alternatively, in case no extra data wants to be collected, one could concentrate the analysis on those customers that apply for a second loan, since then appraisal form should be filled-out again. This would obviously constrain the analysis to estimating the effect of taking a loan on customers that re-apply. Hence, with minimal (or even no) extra effort to collect data, one can perform an econometric analysis of whether the desired effect of a program, such as raised income, is achieved or not.

It should be mentioned that, while suggested methods can be very powerful and cost-effective, establishing causality is a critical issue and - as with every methodology - validity of assumptions is crucial. If assumptions do not hold, one can get biased results and over- or underestimate program impact. It is therefore important, to give the possible failure of assumptions attention. One criticism could for example be that one would expect the effect of taking up a loan to take place gradually over time so that it can get difficult to separate the treatment effect from the time effect due to other factors that vary over the same period. Another important aspect is that microfinance customers are seldom typical of their communities; they might have certain traits and skills, such as motivation and entrepreneurial spirit, that since they are unobserved - can bias estimates and hence lead to a skewed perception of the effectiveness of the program.

The most direct way to address such a potential bias is to collect data on individuals that did not participate in the program - a control group. This would obviously involve time and costs, but would greatly improve estimation results in case assumptions of the before-after approach are believed not to hold. There is a vast literature on program evaluation, but studies that should be mentioned in the context of evaluation of microfinance programs are Coleman (2002), who introduces a very interesting survey design, Pitt and Khandker (1998) and Morduch (1998).

²⁰Village information sheets that are filled-out when expanding operations into a village can enrich the type of data available. These sheets collect information on the size of the village (number of inhabitants), number and types of shops, transportation possibilities, distance to main road,...

6 Conclusions

The topic of ICTs in microfinance is of great importance, because its fundamental goal is the extension of benefits to more and poorer people. While this goal is of interest to many developing countries, especially transition countries are in promising positions. India for example has great experience with successful microfinance projects, but are under pressure to extend the benefits and improve living conditions of its many rural poor. In addition these countries have relatively well-developed ICT sectors and software development capacity, and this local availability of skills presents an opportunity to create the affordable and adaptable software solution that is needed by the small rural MFIs in developing countries. The public sector can play a crucial role in supporting the diffusion of MF services to the poor, by supporting/funding collaborative software development for MFIs, facilitating knowledge networks between MFIs, raising awareness of the advantages of a collaborative approach that is built on FOSS. At the same time, this is a time of opportunity for the private sector, both large MFIs as well as small local organizations and service providers who could support and maintain the IT infrastructure of small remote organizations. We have stressed the importance of providing affordable and appropriate technology to increase outreach of holistic MF services to the very poor. At the same time we are cautious as to the measurable impact of such intervention. It remains a crucial research need to find out more about the individuals that are being reached and the impact on their living conditions, to avoid equating simple increase in numbers of clients with real impact on livelihood. This can only be achieved through carefully designed monitoring and ongoing evaluation efforts. First, it is important to know ‘who’ is being reached and consider the trade-off between increasing outreach and reaching the very poor. We argue that this trade-off is important and that it is the reason why a diverse set of institutions is needed: large institutions that can serve the poor and not-so pure on a large scale and small and local institutions that concentrate on the very poor. Policy-makers need to consider the special support that these smaller institutions might need since their operations are struggling to become self-sustainable. In order to increase the number of such small organizations, governments should lower barriers of entry in this market specifically. This can be done through adjusting the regulatory framework or providing support and services. We argue that the development of a FOSS MIS for these smaller organizations would facilitate their scaling up, and allow them to implement stricter evaluation and reporting standards, which in turn would enable access to donor funding. In addition, government should encourage the collaboration between MFIs of different sizes and at different stages of development. Providing a common technology platform and standards for exchange of data would greatly facilitate this process.

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